Foreign Power Briefs

• **British Columbia Hydro** has reached a tentative agreement to sell uninterruptible power to four California cities. The utility has sold electricity on an interruptible basis to the Pacific Northwest for about 20 years. The power will be received by the Bonneville Power Administration and then sent to Burbank, the Los Angeles Dept. of Power and Water, Glendale and Pasadena. The new Revelstoke Dam on the Columbia River will provide the electricity. British Columbia Hydro is facing a large surplus of power. The utility announced it has postponed, for at least ten years, its plan to construct a dam on the Peace River. All of the Revelstoke Dam's output will be surplus to the province's requirements. The three-year contract with the California cities is subject to Canadian and U.S. regulatory approval.

• **Hydro-Quebec** said it has slashed its capital spending plans for the next ten years from $33.6 billion (Canadian) to $18.08 billion and dropped its demand growth projection from 3.7 percent to 2.9 percent. The utility said the cuts are needed because of the effects of the recession, new hydro power surpluses, conservation and competition from natural gas. Hydro-Quebec also said it plans to continue its efforts to sell electricity in the northeastern U.S. This is the second time the 10-year proposal has been revised. Hydro-Quebec's first forecast in 1980 called for capital spending of $55.5 billion and a demand growth of six percent annually.

• **Japan and the United States** have signed a five-year, $10-million agreement to collaborate on tests of candidate structural alloys for future fusion energy devices, announced the Department of Energy. The joint program with the Japan Atomic Energy Research Institute provides for the use of two high neutron intensity research reactors at Oak Ridge National Laboratory for irradiation testing of both U.S. and Japanese-developed fusion materials. Under the agreement, the two countries will share costs of the materials irradiation program scheduled to begin early in 1984.

• **Chinese-made hydroelectric** turbine generators will be sold in the U.S. by Westinghouse Electric Corporation. Westinghouse said it signed a memorandum of intent with China National Machinery & Export Corp. for small hydro units rated to 25,000-kW. Westinghouse will provide installation, construction and maintenance services.

• **Malaysia and Singapore** will connect their electricity supply grids at the end of 1984, according to Malaysia's National Electricity Board. Circuits will be built that are capable of sending 200 MW between power plants in Singapore and Johore, Malaysia. The Board said five more electricity-sharing agreements are being worked on between the members of the Association of South East Asian Nations—Indonesia, Malaysia, the Philippines, Singapore and Thailand.

• **The Philippines National Power Corporation** (PNPC) is planning to cut its dependence on oil-fired electricity generation in half over the next three years. At a recent meeting of the ASEAN Electrical Engineering Contractors in Bangkok, PNCP Director Conrado del Rosario told attendees that the percentage of Philippine electricty generated by imported oil should drop from 65 percent to 35 percent by 1986. He said the potential for the development of Philippine geothermal power exceeds 10,000 MW. Roasario said that by the year 2000 electricity demand is predicted to be anywhere from 10,000-12,000 MW.

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GPU Nuclear president resigns; NRC staff recommends restart

PARSIPPANY, NJ—In an effort to win NRC approval to restart the undamaged TMI-1 reactor, General Public Utilities Corp. Chairman William G. Kuhns announced that GPU Nuclear (GPUN) President and Director Robert C. Arnold has resigned.

Shortly after the announcement, the Nuclear Regulatory Commission staff recommended that TMI-1 be allowed to operate at 25 percent on a test basis.

During a November NRC meeting, Kuhns also unveiled GPU's plans for the formation of an independent Nuclear Safety and Compliance Committee.

Arnold said in his resignation letter that "...because of the visible and central role I have had in TMI activities over the last four and one-half years, it seems certain that acceptance of GPU's position that TMI-1 will be operated by a new organization with different management than that which was in place at the time of the accident is improved if I step aside."

He was reassigned to a position with the company's non-nuclear operations, said the utility.

Conditions for restart

NRC spokesman Bob Newlin said the staff recommended three preconditions to a TMI-1 restart. First, the investigation into the unit 2 leak rate falsification charges as they pertain to unit 1 must be resolved. Newlin said that could occur shortly. Second, the staff said the plant should not operate above 25 percent during the testing period. And finally, said Newlin, the unit would be under 24-hour NRC inspection during the restart.

Another issue to be dealt with by the commission is whether to allow a restart before a hearing is held on the status of the steam generator tube repairs done on the reactor.

In a Dec. 7 meeting, the NRC staff recommended that resart be allowed without a hearing. The staff said there are no siginificant hazards involved in resarting without holding a hearing first. At press time, the commission was expected to decide on the issue.

Newlin said the only other meeting scheduled by the full commission was for Dec. 19, when a "closed-door" session was to be held to consider all the issues and remaining questions.

Newlin said a restart decision would not be made at the meeting, but that the commissioners would come up with "some general guidance" on the future of the case.

Even though things seem to be quickly moving along, Newlin said there still "has been no date set for a restart decision."

GPUN waiting for OK

GPUN spokesman Doug Bedell said the preconditions to restart recommended by the NRC staff are acceptable to the utility and that GPUN is awaiting a NRC decision. He said TMI-1 will be ready for a restart on January 15.

Just one week earlier to the utility's announcement, GPU r[illegible]d the findings of 83-year old Ret[illegible]dmiral Hyman G. Rickover's investigation into GPU Nuclear. He concluded that "...the corporation has the management competence and integrity to safely operate TMI-1."

One of the major stumbling blocks for the NRC in deciding whether to allow the reactor to restart has been the question of management integrity at GPU Nuclear. Commissioner Victor J. Gilinsky has on numerous occasions called for a complete overhaul of GPU Nuclear's top management.

In June 1983, GPU reassigned 15 professional, supervisory and middle and upper management employees at the plant in order to resolve the management integrity issue.

Clark new president

Kuhns "regretfully accepted" Arnold's resignation and said current GPU Nuclear Executive Vice President Philip Clark will succeed Arnold. GPU Nuclear Vice President Edwin Kintner was named to replace Clark.

"We are hopeful that the combination of the management changes announced today, and those implemented last summer, will provide the commission with the basis to proceed on the TMI-1 restart decision while the remaining open issues are investigated and resolved," stated Kuhns.

The Nuclear Safety and Compliance Committee will be made up of three new outside directors that will be added to the Board of GPU Nuclear. The utility is currently examining candidates for posts and has set no timetable for filling the slots.

Kuhns said the committee will be financed by the GPU operating company owners, and will include a staff to be selected and supervised by the committee. The group's role will be to monitor the operation and maintenance of GPU's nuclear units. Kuhns said the committee will also be expected to provide "... independent and integrated evaluation of their own in-plant observations, NRC inspections; industry evaluations and any other pertinent information."

A GPU spokesman said the committee will be permanent.

Rickover's conclusion

In September 1983, Kuhns asked Rickover to assess the soundness of GPU Nuclear. Working with three associates, Rickover interviewed personnel, reviewed documents and came to the conclusion that GPU Nuclear "has the management competence and integrity needed to safely operate the undamaged reactor.

For his approximately two and one-half months work, GPU said it will pay $25,000 per month for three months to the H. G. Rickover Foundation, where Rickover will then distribute the money to the charities of his choice.

Rickover said the evaluation offered him the "...opportunity to apply the successful principles on which the (U.S.) Naval program was based to an evaluation of GPU Nuclear's competence to operate TMI-1."

Recommendations

Five recommendations came out of Rickover's report. He suggested:

1. GPU Nuclear devise a plan so that TMI-1 and the Oyster Creek plants achieve a ranking in the top one-sixth of all commercial power plants in the INPO evaluations.
2. Senior management become technically informed and personally familiar with plant conditions.
3. Personnel in the TMI-1 training department responsible for training operators who are not yet qualified as senior reactor operators be qualified as soon as possible.
4. GPU Nuclear Corp. should continue to reduce its dependence on the use of consultants.
5. The public address system in the plant be upgraded.

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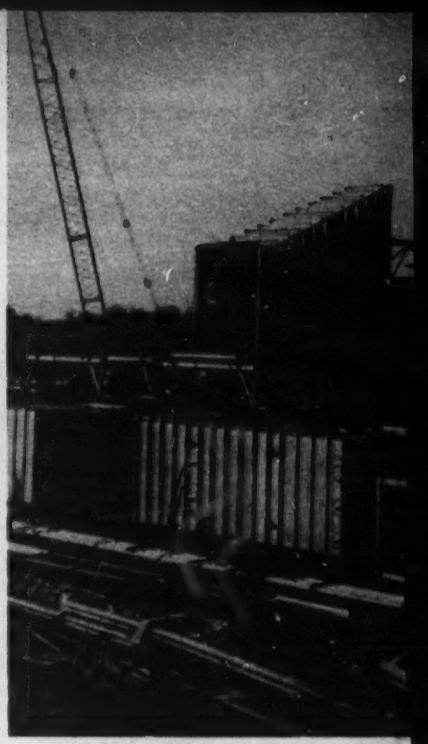
Acid rain regs will be falling on utilities in '84, but not too hard



Robert Smock
Managing Editor

Acid rain regulations are coming. They'll probably come this year, requiring retrofits of sulfur dioxide scrubbers on some old power plants. That's the bad news.

The good news is that the regulations will probably be much milder than the harsh measures proposed in federal legislation in 1983. That's because action on acid rain will probably not come in the form of new laws from Congress but from the administration in the form of Environmental Protection Agency regulations.

The Clean Air Act empowers EPA to reduce sulfur dioxide emissions from existing sources if the administrator deems it necessary to control pollution crossing an international boundary. With the Canadians screaming for action by the U.S., the stage is set.

Action by EPA is likely because acid rain was the issue the administration used to defuse the Burford-Gorsuch/toxic waste fiasco of a year ago. As you'll recall, that was developing into a major political liability for the Reagan administration. The president neatly solved the problem by dumping Burford, bringing in William Ruckelshaus as a "Mr. Clean" to run the EPA, and promising action on acid rain.

Through the course of the summer pressure mounted for action. The Canadian government and politicians from northeastern states in the U.S. complained about their dying lakes and forests. A total of 15 bills was introduced in Congress calling for controls. Several scientific groups published reports in mid-summer suggesting that sulfur dioxide from power plants causes acid rain.

In response, the administration, through EPA chief Ruckelshaus, let it be known that a proposal would be out by October. However, the deadline passed and no action was taken.

There are various explanations of what happened. The most likely is that political pressure was relieved by international events—the bombing in Lebanon and the invasion of Grenada. Attention was diverted. When Ruckelshaus took his acid rain recommendations to a committee of high-level administration officials they were brushed aside as too costly and unnecessary. The EPA head was sent back to the drawing board while Reagan's advisors waited to see how the political winds would blow. That's where the situation now stands.

Action is likely in 1984 because acid rain is a political time bomb that the administration does not want to allow to blow up. Failure to act would hand over an issue to political opponents who desperately need a good, scary one like acid rain.

Observers are looking to the presidential primary election in New Hampshire next month for an indication of how potent an issue acid rain will be. John Glenn has already said he favors action, even though he comes from a high-sulfur-coal mining state. New Hampshire is right in the middle of the region that is squawking the loudest about damage so, even though most of its voters are rock-ribbed conservatives, it should provide a good test for the political significance of acid rain.

Science and acid rain

One of the major problems in deciding what action to take, if any, to control acid rain is the lack of scientific data or understanding about it.

Of the many groups of scientists working on the problem, the most important is the National Acid Precipitation Assessment Program. This group has the most effect on policymakers, both in EPA and Congress.

It is part of a federal government program that was started by the Acid Precipitation Act of 1980. It was intended to advance the conversion of oil-fired power plants to coal by deflecting acid rain-based objections through a 10-year scientific study. It involves 12 federal agencies and will spend $22 million this year.

The federal task force's most recent annual report was issued last summer and was one of the sources of pressure on policy makers because it said that the major contributor to acid deposition in North America is probably man-made pollution. However, the report also supported those urging caution on acid rain controls by pointing out that no exact link can be made yet between specific emissions and acid rain patterns.

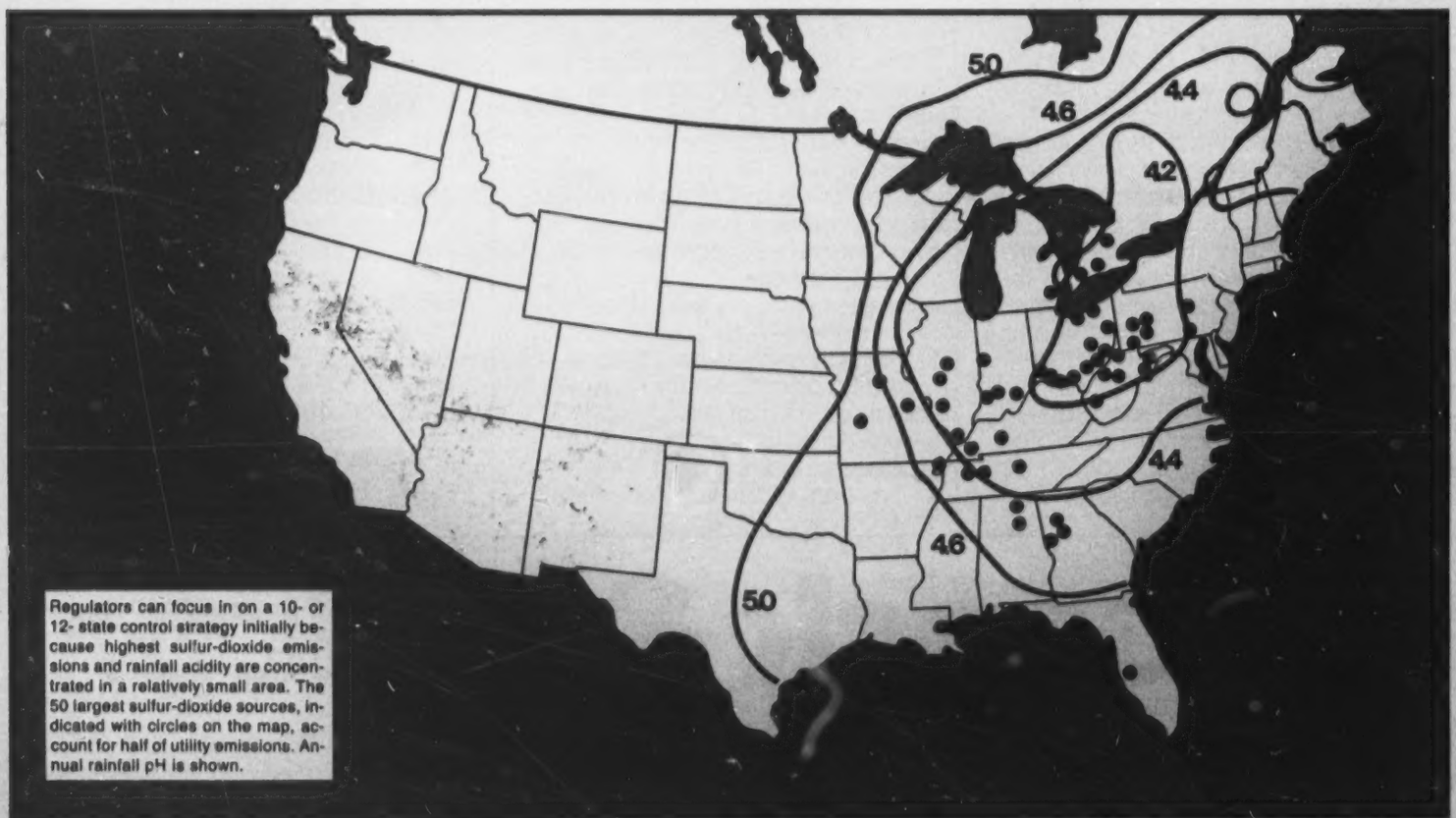
Wait 'til 88

The top EPA scientist on the task force, Gary Foley, says that information on acid rain right now is sparse but the pace is picking up fast. "We expect to have a lot accomplished by 1988," he promises. Within five years, says Foley, scientists will be able to quantify damage from acid rain, specify what level of acid rain is acceptable, and specify what emissions should be reduced to control unacceptable acid rain.

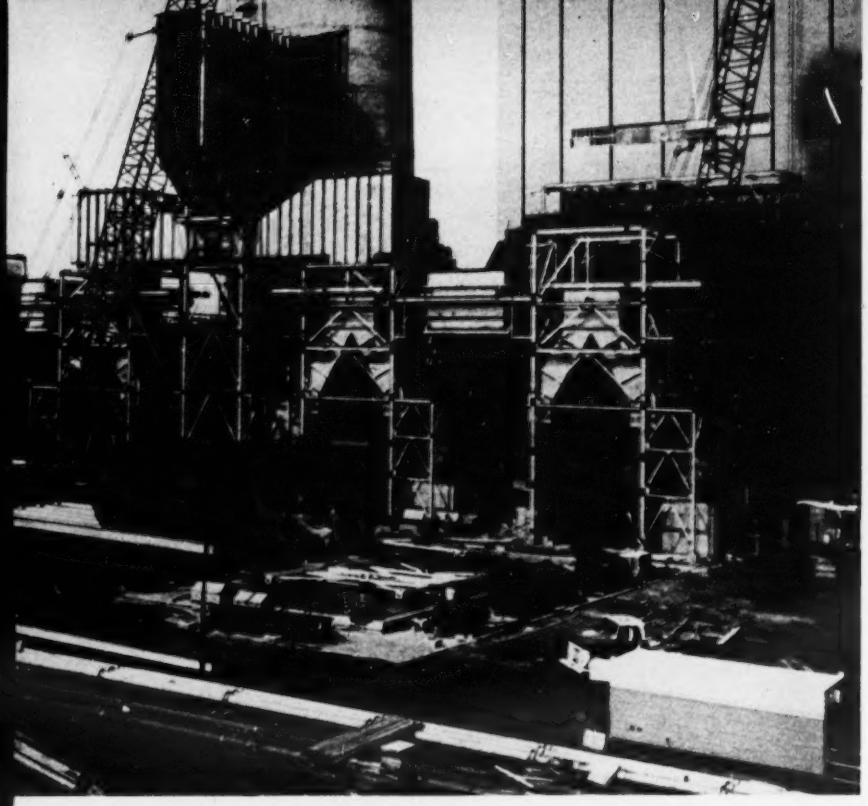
"Existing atmospheric models can not be used with accuracy," says Foley. Such models are necessary to link areas being damaged to specific plant emissions. Foley says a reliable model should be in use by 1986.

Should the politicians wait 'til 88? "It's a decision for the policymakers whether they want to wait," says the EPA scientist.

The head of the federal research task force is Chris Bernabo from the National Oceanic and Atmospheric Administration. He says that acid



Regulators can focus in on a 10- or 12- state control strategy initially because highest sulfur-dioxide emissions and rainfall acidity are concentrated in a relatively small area. The 50 largest sulfur-dioxide sources, indicated with circles on the map, account for half of utility emissions. Annual rainfall pH is shown.



Sulfur dioxide scrubbers, required on all new utility power plants, are now commonplace in the industry. Shown is a scrubber now under construction at Public Service of Indiana's 650-MW Gibson unit 5 capable of removing 85 percent of the SO_2.

1. TOP 50 COAL-FIRED POWER PLANTS IN EASTERN NORTH AMERICA RANKED ACCORDING TO TOTAL SO_2 EMISSIONS IN 1979

Rank	Plant	State	Country	Estimated SO_2 emission thousands of metric tons/year
1	Paradise	Kentucky	U.S.A.	372.5
2	Muskingum	Ohio	U.S.A.	340.2
3	Gavin	Ohio	U.S.A.	339.5
4	Cumberland	Tennessee	U.S.A.	289.7
5	Monroe	Michigan	U.S.A.	264.8
6	Clifty Creek	Indiana	U.S.A.	263.7
7	Gibson	Indiana	U.S.A.	2[illegible].1
8	Baldwin	Illinois	U.S.A.	257.9
9	Labadie	Missouri	U.S.A.	224.0
10	Kyger Creek	Ohio	U.S.A.	205.5
11	Bowen	Georgia	U.S.A.	202.6
12	Conesville	Ohio	U.S.A.	186.8
13	Mitchell	West Virginia	U.S.A.	186.2
14	Hatfields	Pennsylvania	U.S.A.	167.3
15	New Madrid	Missouri	U.S.A.	164.0
16	Semmis	Ohio	U.S.A.	160.7
17	Lambton	Ontario	Canada	160.2
18	Wansley	Georgia	U.S.A.	159.7
19	Homer City	Pennsylvania	U.S.A.	159.1
20	Johnsonville	Tennessee	U.S.A.	157.9
21	Nanticoke	Ontario	Canada	156.0
22	Gaston EC	Alabama	U.S.A.	154.8
23	Montrose	Missouri	U.S.A.	147.1
24	Harrison	West Virginia	U.S.A.	142.8
25	Brunner Isl.	Pennsylvania	U.S.A.	142.0
26	Coffeen	Illinois	U.S.A.	141.8
27	Cardinal	Ohio	U.S.A.	140.8
28	Eastlake	Ohio	U.S.A.	137.4
29	Kammer	West Virginia	U.S.A.	136.8
30	Kincaid	Illinois	U.S.A.	136.3
31	Keystone	Pennsylvania	U.S.A.	127.2
32	Stuart J.M.	Ohio	U.S.A.	125.6
33	Cayuga	Indiana	U.S.A.	121.7
34	Shawnee	Kentucky	U.S.A.	111.0
35	Gallatin	Tennessee	U.S.A.	110.6
36	Montour	Pennsylvania	U.S.A.	109.4
37	Big Bend	Florida	U.S.A.	109.2
38	Conemaugh	Pennsylvania	U.S.A.	108.9
39	Widows Creek	Alabama	U.S.A.	106.0
40	Amos	West Virginia	U.S.A.	105.2
41	Thomas Hill	Missouri	U.S.A.	104.9
42	Joppa Steam	Illinois	U.S.A.	104.4
43	Mt. Storm	West Virginia	U.S.A.	102.5
44	Petersburg	Indiana	U.S.A.	100.7
45	Beckjord	Ohio	U.S.A.	99.7
46	Avon Lake	Ohio	U.S.A.	98.0
47	Fort Martin	West Virginia	U.S.A.	94.6
48	Miami Fort	Ohio	U.S.A.	94.2
49	Lakeview	Ontario	Canada	91.4
50	Yates	Georgia	U.S.A.	88.6

Source: Ontario Ministry of Environment

rain is causing damage, but faced with the question of what control strategy should be used, says, "We can't write the prescription yet."

Bernabo says that the research to date has shown there is long-range transport of combustion-related emissions that cause acid rain, but that linking a specific source to a specific receptor area is an unsettled question. He says it is certain that some lakes and waterways are being damaged, adding that 20 percent of the lakes in the Adirondack region of New York are susceptible to damage due to low natural alkalinity.

On the other hand, results of research so far on crop damage have been "highly confusing," says Bernabo. In some cases researchers have seen harm from acid deposition; in other experiments the acid rain acts as a fertilizer. Another open question is the relationship between acid rain and the dieback of Spruce trees that's occurring in the eastern U.S.

"We have problems now because we didn't collect the basic data in the past," says Bernabo. "We're trying to rectify that."

The scientist does not, however, conclude that politicians should wait for definitive results from the researchers. "Politically, just a threat of damage may be enough to motivate action," he notes. "The politicians have moved ahead of the scientists, which is not unusual for these issues," he says, adding that deciding when you know enough to act is up to the politicians, not the scientists.

Bernabo says that administration officials favoring and those opposing acid rain action are at a standoff right now, "Administration policy is on the edge."

The scientists haven't provided any firm guidelines but they have set the stage for modest action on acid rain in 1984 to be followed by more far-reaching regulations in five years if the research results then available support more drastic action.

EPA's options

Some clues as to what that modest proposal might be were presented at a recent meeting on acid rain by Paul Stolpman, special assistant to the director of EPA's office of policy and analysis. Stolpman first outlined the chief problems:

- What states should be affected by the regulations? Stolpman noted that action has been proposed for the entire continental U.S., at one extreme, and for a region as small as four northeastern states at the other. In the first round of analysis EPA concentrated on the 31 states east of and bordering the Mississippi River—the states where rainfall pH is low, as shown on the map.
- How much should emissions be reduced? Noting that sulfur dioxide emissions in the 31 state region were 19 million tons a year in 1980 (16 million from utilities), Stolpman reported that EPA analyzed, in detail, strategies calling for reductions of 4, 8, and 12 million tons per year by 1995, as shown in Table 2. Additional variations for other state groupings were also checked.
- How should the reductions be allocated? Each state could be given a quota, or the reduction could be spread over the most prolific sources of SO_2, or controls could be imposed on the SO_2 sources that are linked to the worst damage, Stolpman said.

As the analysis proceeded last summer, the advisor related, EPA policymakers converged on favoring the 8 million ton reduction option in the broad, 31-state region. Main reason was that the cost curve kneed upward sharply at the 8-10 million ton point. As shown in Table 2, the annualized cost and present value of cumulative costs for the 12 million ton option are disproportionately high.

"The 12 million ton reduction gets you more than you need at massive cost," said Stolpman, "and the 4 million ton reduction doesn't get you there in terms of protecting sensitive areas." The late summer focus was on a strategy to slash SO_2 emissions by 8 million tons a year by 1995.

High sulfur coal vs. low sulfur

One of the many troublesome subproblems associated with this strategy is the issue of coal miners' jobs in states that produce high-sulfur coal.

As shown in Table 2, utilities would probably achieve the 8 million ton reduction in the EPA analysis by retrofitting scrubbers on 19,000 MW of existing capacity and by replacing high-sulfur coal in existing plants without scrubbers with 80 million tons of imported, low-sulfur Western coal.

The emission reduction could be achieved without increasing imports over the base case by increasing the capacity retrofitted with scrubbers to 80,000 MW, Stolpman reported. That would increase the cumulative capital cost from $6 billion to $25 billion.

That might appear prohibitive but remember that the high-sulfur coal producers fought and won a similar battle with the 1977 Clean Air Act amendments. Prior to that change in the law utilities could avoid installing scrubbers on new plants by burning low-sulfur coal. The change required all new power plants to install scrubbers regardless of the sulfur level of the coal burned. That effectively halted the transport of low-sulfur western coal to eastern utilities for use in new power plants.

Now the battle is shaping up again over what to do with the older plants that are still burning high-sulfur coal and don't have scrubbers. The coal industry has split.

The unionized, high-sulfur coal producers located chiefly in states east of the Mississippi are lining up against the non-unionized low-sulfur companies in the West. In fact, the low-sulfur group recently formed a lobbying organization called the Alliance for Clean Energy to fight for the "least cost" approach to reducing SO_2.

A more modest strategy

EPA's Stolpman reported that the broad-regional 31 state, 8 million ton plan has been shelved because the, "complicated nature of politics, costs, and environmental control options

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The scrubber retrofit cost issue deflected the 31-state crackdown planned last summer...can it deflect the 10-state strategy now being developed by EPA?

were underestimated."

The new focus is rumored to be on a sub-regional plan calling for reductions in stages. The first stage would affect the 10 or 12 states that produce the most SO_2 emissions and are closest to the area in the northeast that's suffering aquatic damage according to research findings already in from the federal task force. The "second shoe" would drop in 1988 on other states based on future research.

The 10 state group includes the six New England states plus New York, Pennsylvania, Ohio, and West Virginia, Stolpman reported. Michigan and Indiana could be added to get a 12-state group. The advisor said the strategy could go as far as targeting specific plants in the target states.

Emission control methods

The methods that can be used by utilities to reduce SO_2 emissions from older coal-fired power plants are shown in Table 3. The most popular methods will probably be conventional scrubbers and low-sulfur coal (if it's to be permitted).

Sulfur dioxide scrubbers have made great inroads in the utility industry since EPA began forcing their use about 10 years ago. There are 114 generating units in the U.S. with flue-gas desulfurization devices, totaling 46,000 MW or 16 percent of coal-fired capacity in place. (Note that only 17,000 MW of that scrubbed capacity is in the 31-state acid rain region. That's because most of the growth in the utility industry since passage of the Clean Air Act in 1970 has been in the west.)

EPA projects that, without any change in the regulations, there will be another 121 units with scrubbers in operation during the next 10 years, totaling another 70,000 MW. At that time, 34 percent of coal-fired capacity will have scrubbers. For the most part these scrubbers will be on new plants built since 1971, but there are a few retrofits.

EPA reports that utilities are becoming highly familiar with conventional scrubber technology. There are 14 utilities with more than 100,000 operating hours of experience.

At the recent flue-gas desulfurization symposium sponsored by EPA, Paul Ireland of Stearns-Roger Engineering Corp. reported some preliminary results from an acid-rain retrofit cost study the firm did for EPRI. He said the intent of the study was to provide guidelines for utilities faced with the need to retrofit. Guidelines have been completed for limestone scrubbers, Ireland said, and similar guides are being prepared for five other scrubber types. The final report is due this month.

Ireland reported that the average premium a utility will have to pay for a scrubber retrofit over the cost of a scrubber for a new unit is about 30 percent. The range for potential retrofit cost premiums is 10 to 100 percent.

Another speaker from Stearns-Roger, describing the results of an EPRI study on costs for scrubbers on new capacity, said the costs will be:

- Limestone—$175/kW, 18 mills/kWh;
- Lime—$165/kW, 20 mills/kWh;
- Lime dual alkali—$150/kW, 17 mills/kWh;
- Limestone dual alkali—$160/kW, 16 mills/kWh;
- Limestone, forced oxidation—$175/kW, 16 mills/kWh;
- Chiyoda Thoroughbred 121—$140/kW; 14 mills/kWh;
- Saarberg-Holter—$130/kW, 16 mills/kWh.

These "conventional" technologies all have high capital costs in common. (Retrofit costs will be 10 to 100 percent higher than these.)

An EPA official, John Milliken, put the retrofit costs even higher. He said an EPA analysis showed conventional limestone scrubbing retrofitted to a 500-MW, high-sulfur-coal burning power plant would cost $270/kW. Use of adipic acid would only reduce the cost to a reported $240/kW.

2. EMISSIONS, UTILITY COST, AND COAL MARKET IMPACTS OF ALTERNATIVE 4, 8, AND 12 MILLION TON SULFUR DIOXIDE EMISSION REDUCTIONS

Category	Year 1990	Base Case 1995	Interstate trading changes from base case Reduction from 1990 Levels 12	8	4
SO_2 Emissions—Eastern States					
Utility	16.2	17.5	-13.8	-10.1	-6.6
Industrial	2.6	3.3	-0.4	-0.4	-0.4
Total	18.8	20.8	-14.2	-10.5	-7.0
Utility					
Annualized Cost (10^9 $'s) Cap.	–	–	+3.7	+0.7	+0.1
O&M	–	–	+1.8	+0.5	+0.1
Fuel	–	–	+3.6	+2.5	+1.4
Total	–	–	+9.1	+3.7	+1.6
Industrial Annualized Cost (10^9 $'s)	–	–	+0.6	+0.6	+0.6
Cumulative Capital Cost[3] (10^9 $'s)	–	–	+32.3	+8.2	+0.6
Present Value of Cost (1983-2010) (10^9 $'s)	–	–	+222.1	+60.9	+15.6
Coal Production (10^6 tons)					
N. Appalachia	185.1	213.0	-43.4	-61.6	-39.6
C. Appalachia	232.8	294.8	+60.2	+65.7	+47.2
S. Appalachia	26.4	26.8	-2.3	+0.9	-0.2
Midwest	134.4	181.9	-97.4	-92.5	-73.8
West	251.0	584.6	+94.0	+97.7	+63.1
Total	829.7	1300.1	+1.1	+0.2	-3.2
Average Cost-Effectiveness ($/ton SO_2 Removed)	–	–	660	370	250
Scrubber Capacity (GW)	16.7	43.0	+116.2	+18.9	+1.3
% Change in Electricity Rates	–	–	8.0	3.2	1.4
Western Coal Shipped East	36.7	74.2	+79.9	+79.2	+48.8

Source: EPA Acid Deposition Task Force, August 1983.

Dry scrubbers would only cost $160/kW, but they've yet to be proven on high-sulfur applications.

Furnace injection revived

EPA analysts are looking at a cheap and dirty desulfurization method called furnace injection as a way to provide a low-cost retrofit option—a mere $60/kW says Milliken. The method calls for blowing lime or limestone particles into the furnace with the coal and collecting the resulting calcium sulfate in a particulate collection device at the back end. It's like dry scrubbing without the spray dryer.

EPA policy analysts say this method could be used to reduce SO_2 emissions by 50 percent from older power plants. That's far less than the 90 percent reduction possible with conventional flue-gas desulfurization, but 50 percent might be acceptable in a modest, low-cost strategy intended for early adoption. It could even be combined with burners designed for low nitrogen oxide emission—the limestone injection, multi-stage burner, or LIMB, as shown in Table 3.

Mike McElroy, an EPRI project manager, described at the symposium some work EPRI is doing to develop furnace injection technology. He noted that bench- and pilot-scale work has shown a high potential for boiler tube slagging, fouling, and erosion, especially in typical retrofit applications. However, he added that work being done by Mitsubishi Heavy Industries shows that conventional sootblowing equipment may be capable of dealing with tube deposits. McElroy said the cost of a furnace injection retrofit could be a low $70 to 80/kW, even including the additional particulate collection capacity that would be required. He said a test on a 50- to 100-MW scale utility boiler is planned for late 1985 and that a full-scale test is planned for 1988.

Bill Elder, an experienced scrubber engineer from TVA, recalled that the utility industry had a lot of bad experience with furnace injection technology in the late '60s and abandoned it. "We have a lot of information in the files on this," he told the symposium, adding, "Let's use it."

3. RETROFIT CONTROL TECHNOLOGIES FOR COAL-FIRED UTILITY BOILER

Process	SO_2 and NO_x removal efficiencies	Status	Estimated* capital costs ($/kW)	Applicability	Problems
Flue gas desulfurization (lime or limestone scrubbing)	90% SO_2 Reduction	Commercial	200 to 300	Most large utility boilers; costs could sharply increase over estimated values for difficult retrofits.	High costs; especially for difficult retrofits. Large quantities of wet waste to be disposed of.
Physical coal cleaning	20 to 30% SO_2 Reduction	Commercial	40 to 50	Centralized cleaning facilities can allow broad applicability	Limited SO_2 removal; especially for difficult to clean coals. Large quantities of pyrite solid residue for disposal.
Low-sulfur fuel switching	60 to 80% SO_2 Reduction	Commercial	26 to 61	Most utility boilers	Boiler derating sometimes required. Potential displacement of locally mined coal.
Low-NO_x burners (second generation)	60 to 70% Reduction	Early Commercialization	2 to 7	Most modern utility boilers	NO_x removal only; no SO_2 removal.
Limestone injection multistage (Low NO_x) burners (LIMB)	50 to 60% SO_2 Reduction 50 to 60% NO_x Reduction	Developmental	27 to 37	Most utility boilers	Technology will be commercial no earlier than 1995. Questions must be resolved regarding performance and boiler reliability.

*Based on 300 MW, 3% sulfur coal, and Dec. 1982 dollars.

Source: Annual Report, 1982, National Acid Precipitation Assessment Program.

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Electric Light & Power

THE NEWS MAGAZINE OF ELECTRIC UTILITY MANAGEMENT AND TECHNOLOGY

NARUC says shareholders should pay up to one third of EEI membership dues

WASHINGTON, D.C.—Up to 33 percent of Edison Electric Institute dues, now borne by ratepayers, should be paid by participating members shareholders, a preliminary report by the National Association of Regulatory Utility Commissioners (NARUC) has concluded.

The investigation into EEI expenditures was conducted by the NARUC Staff Subcommittee on Accounts.

The subcommittee also concluded that all contributions by member utilities to the EEI media communications program should be borne by shareholders, and that ratepayers of member utilities were the rightful contributors to programs administered by EEI, such as the Electric Power Research Institute and the Nuclear Safety Analysis Center.

The funds for at least nine such programs were channelled through EEI in 1982.

EEI has taken vigorous exception to many of the conclusions of the report and has challenged a number of the subcommittee's findings.

Purpose not achieved

The point of the NARUC probe into EEI expenditures is to provide some generic guidance to aid state commissions in determining which items should be expensed. However, in its preliminary report, the subcommitee concedes that it was unable to accomplish its main purpose: to clearly delineate those EEI activities and expenditures that legitimately should be charged to ratepayers and those that are identified with shareholder interests.

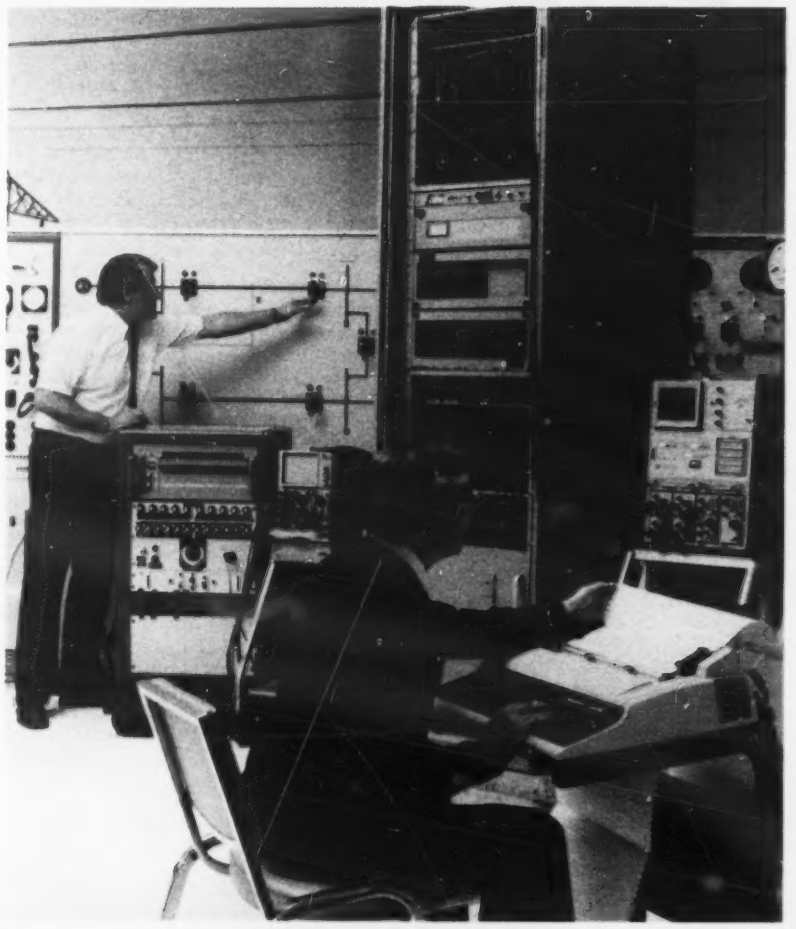
The NARUC subcommittee blames its lack of success on EEI's failure to respond comprehensively to its inquiries. Specifically, EEI refused to disclose the salaries of its staff attorneys, and initially declined to provide audit reports of its financial statements.

EEI said subsequently that on November 22 it had supplied the audit reports.

In a letter to EEI president William McCollam, Jr., NARUC subcommittee chairman John J. Gibbons, a member of the California Public Utilities Commission, charged that despite the answers that EEI provided to subcommittee inquiries, "the frank and open approach that we had hoped for is missing."

"...There simply is not sufficient information in the responses to segregate those expenditures that regulatory commissions might consider to be more properly attributable shareholders than to ratepayers," Gibbons wrote.

Continued on page 11



Industry 'first' shipped

The first of two prototype microprocessor-based digital transmission-line protection and control systems has been shipped to Public Service Electric & Gas Co. The system, shown above during manufacturer's testing, will be installed at the utility's Branchburg substation in Newark, NJ. Developed under an Electric Power Research Institute contract by General Electric, the system is designed to survive extreme substation temperature, humidity and electro-magnetic interference environments. Initially the system will be tested in a monitoring mode, then will be used for primary 500-kV line protection. A second unit will be installed later at the Deans substation end of the line.

PSI abandons Marble Hill

INDIANAPOLIS—Citing the inability to continue financing the Marble Hill nuclear plant, Public Service Indiana has decided it will abandon the project.

The announcement comes on the heels of the findings of a task force established by the Indiana governor and constituted of area businessmen. The task force concluded, in part, that there was not sufficient economic justification to complete the two-unit nuclear project.

"PSI cannot and will not proceed," said utility spokesman Michael Goss. He added that although the company still believes completion is in the best interest of ratepayers and stockholders, financial and political circumstances have rendered completion infeasible.

Governor Robert D. Orr is up for reelection next year and will be campaigning around the issue of utility rates in the state.

Cancellation not unilateral

Abandonment, which is contingent on the as-yet unobtained concurrence of the Wabash Valley Power Association, PSI's partner in the project, represents something of a watershed decision in the investor-owned electric utility industry. No plant construction has been so far along and been abandonded.

Gov. Robert D. Orr

Unit 1 is about 60 percent complete and unit 2 is about 37 percent complete.

Dividend cut

PSI said on January 17 that it would cut its quarterly dividend by 65 percent—from 72 cents per share to 25 cents per share.

Continued on page 2

Utilities set all-time output record; sales, revenues up in 3rd quarter

WASHINGTON, D.C.—More electricity was distributed in the U.S. during 1983 than in any other year, said the Edison Electric Institute.

The utility association said more than 2.3 trillion kilowatt-hours were distributed by electric utilities during the year, surpassing the previous high set in 1981 by 1.2 percent.

"The unseasonable hot weather we experienced during the summer and the bitter cold of December created tremendous demand for electricity," said Douglas C. Bauer, EEI senior vice president. "Coupled with a healthier economy that rebounded from the recession of 1982, electric output increased 3.6 percent over the previous year."

Bauer said the largest increase in 1983 occurred in the West Central region (ND, SD, MN, NB, KS, IA and parts of MT, WI and MO) where generation increased 5.8 percent above 1982's total.

The Southeast region (FL, GA, AL, NC, SC, KY, TN and parts of MS, WV and VA) distributed 5.1 percent more power than in 1982. The Pacific Northwest region experienced the only decline over 1982 at -1.4 percent.

EEI also reported that the hotter than average summer and a pick-up in business activity helped increase 1983 third quarter electric utility sales, revenues and kilowatthour use.

EEI says that electricity sales in the quarter rose 9.8 percent over 1982's figures, from 550 billion kilowatthours to 603 billion-kWhr.

At the same time, revenues for the electric utility industry jumped from $33 billion in 1982's third quarter to $38 billion in 1983, an increase of 15.4 percent.

Foreign Power Briefs

• **Polish coal** may soon be on its way to Tampa Electric Company. Utility spokesman Greg Truax says Tampa Electric is close to finalizing a deal with a trading company for the delivery of 100,000 tons of low-sulfur coal for its Big Bend power plant. The coal will be shipped in two-50,000 ton carriers for an undisclosed amount of cash. Truax said the price of the coal makes it "very advantageous" to purchase, but that it is only a one-time spot purchase. The recent high cost of Polish coal and the country's political strife has kept Tampa Electric out of the Polish coal market for the past few years, said Truax.

• **Israel's** Ormat Turbines, Ltd. and Southern California Edison Co. have signed an agreement to build and operate a solar pond power plant in California. Edison Senior Vice President Dr. Lawrence T. Papay said the solar pond plant will be the world's largest and will initially produce 15 million-kWh a year. Papay said three more units of equal size will be added later to bring the plant to its eventual capacity of 48,000-kW. Ormat has developed and demonstrated a refined Rankine cycle turbine-generator for solar pond power generation. In a standing pond of salt water, the heavier saline water stays on the bottom. Heat created by solar energy penetrating to the saltier and heavier water at the pond's bottom is trapped. The heated salt water drives the Rankine turbine-generators in which a working fluid with a low boiling temperature is substituted for water.

• **The Japanese Federation of Electric Power Companies (FEPC)** has decided to participate in the research and development programs of Three Mile Island. FEPC will contribute up to 22 engineers and $18 million over a five-year period to R&D at TMI. FEPC said the information learned in the research "will have a significantly positive impact on the promotion of development in nuclear technology, especially in the field of the design of reactors, dismantling and medium- and high-level radioactive waste disposal." General Public Utilities said the agreement will be finalized sometime in February or March.

• **Denmark** will start mass production of a small urban electric car in April. About 2,000 cars will be manufactured by Hope Automobil Industri of Hadsund next year and 10-12,000 in 1985. *Electrical Review* reports that the Hope "Wisper" will operate 100 kilometers between charges. The front wheel drive car has a 7.45-kW, 72V series wound d.c. motor and 12x6V deep cycling lead acid batteries. Marketing Manager Dan Wildenrath said tests to check the car's compliance with U.S. vehicle regulations are taking place in Germany.

• **China's** official news agency Xinhua reports that construction of a 133 km, 220-kV transmission line in northeast China has been completed. The news agency said the line will eventually connect a major hydroelectric station, currently under construction, to the northeast China power grid. Xinhua said the new Baishan hydro plant will have a capacity of 1,500 MW. The first 300 MW unit is expected to be put into operation shortly.

• **The South Korean government** has decided to postpone construction of two nuclear units, KNU-11 and KNU-12. The Ministry of Energy and Resources said construction of the units was to begin in 1984, but now will likely start sometime in mid-1986. Work on six units presently under construction may also be delayed from six to 10 months, said the ministry. Demand growth forecasts have been lowered and estimates of South Korea's foreign debt place it at almost $40 billion, said *Nuclear Engineering International*. The government says it would be very difficult to come up with the money for the two postponed units in the near future.

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EL&P readers whose responsibilities include both Generation and Transmission/Distribution receive both technology sections. Other readers receive the technology section that applies to their respective area of responsibility. The Generation edition is indicated by a single dot (•) in the upper right corner of page 1; the T/D edition carries two dots (••). All readers receive EL&P's industry news section.

Marble Hill . . . from page 1

In another move directed at alleviating its worsening financial position, the company said it had filed with the Indiana Public Service Commission for emergency rate relief. PSI is asking for $105 million per year to help meet its current financial obligations.

Further, the company's board of directors has asked PSI to begin preparing rate cases for Marble Hill that would seek to recover the utility's investment in the project, which presently is estimated to be over $2 billion.

Cooperative takeover?

Although discussions have been proceeding, no agreement has been reached between PSI and the Wabash Valley Power Association, the generation and transmission cooperative that owns 17 percent of Marble Hill.

Wabash spokesman Craig Palmer said that independent studies conducted by the cooperative show that it is still in that utility's economic interest to complete Marble Hill.

At press time the cooperative was examining whether it would be able to take over the plant, although Wabash itself concedes such an enterprise would be "an uphill fight."

Financing needed

Palmer said that Wabash would be looking at innovating financing techniques, would seek financial commitments from the Rural Electrification Administration and other utilities, and would try to get Public Service Indiana to commit itself to some sort of power buy-back plan. Ideas on such an action were expected to be presented to the Wabash board of directors by February 1.

The board consists of two representatives from each of 24 member systems. Collectively, Wabash serves about 170,000 customers.

Task force findings

Moved by what he contends is consumer concern in the state, Indiana Governor Robert D. Orr in late summer directed the Public Service Commission to suspend its review of the rate control plan submitted by Public Service Indiana. The plan had been offered as the utility's way of securing additional financing for the plant and completing construction (see *EL&P*, September 1983, page 1; December 1983, page 1).

At that time the governor also set up his 5-member task force to conduct an independent review of PSI's financial situation and to provide recommendations dealing with the feasibility of continuing with Marble Hill.

Estimates pessimistic

Calculating that the estimated cost of completing the two-unit nuclear station would be at least $600 million more than the current utility estimate of $7.1 billion, and probably would be even more than this, the task force concluded that "the economic case in favor of completion would have to be much stronger than presented to justify the risk of at least an additional $5 billion above current sunk costs."

In the opinion of the task force, the total costs of Marble Hill, even if completed on schedule, did not justify completion when compared with the alternative of building coal-fired plants, even assuming new SO_2 emission standards.

Benefits optimistic

The task force also found that PSI conclusions, showing benefits from completing the plant flowing to ratepayers after 1996, were optimistic. The task force found that such benefits, if any, would occur much later.

"The most optimistic justification for completion of Marble Hill involves assumptions about the level and pricing of off-system sales which we believe are incorrect," the task force reported. "This justification, even if we were inclined to accept it, would not be strong enough to support extraordinary financing measures such as CWIP or trended rates."

Other recommendations

The task force further recommended that:

• PSI and its shareholders absorb the substantial portion of all Marble Hill costs, up to the point where the utility's ability to access capital markets becomes impaired. To go beyond this point, the task force said, would result in even higher rate increases and/or deterioration of service for PSI customers.

• PSI demonstrate that it has exercised all possible financial remedies, including reassessing its dividend policy, prior to seeking ratepayer participation.

• If ratepayer contributions are necessary, total Marble Hill costs should be amortized over a 20-year period and PSI should not be allowed to earn a return on its investment in the nuclear plant.

Recommendations supported

In endorsing the recommendations of his task force, Indiana Governor Orr said, "As far as I'm concerned, this task force has performed the most comprehensive and objective analysis of the Marble Hill situation to date."

He noted that the task force, comprised of businessmen from Indiana, had no vested interests and were "unconstrained" in proposing remedies. Declaring that the task force had comprehensively investigated the problem, Orr added, "...more analytical talent has never before examined this issue. In addition to the five task force members, the resources of two internationally prominent consulting firms were utilized."

Responding to the task force report PSI chairman Hugh A. Barker emphasized that the company was intent on protecting its financial integrity, noting that shareholders rights to recover their investment in Marble Hill would be "forcefully" defended.

NRC OK's license for LaSalle

WASHINGTON, D.C.—The Nuclear Regulatory Commission has given the go-ahead to Commonwealth Edison for fuel loading and low-power testing at the utility's La Salle County Unit 2 nuclear plant.

In late December, the NRC issued an operating license authorizing the fuel load and low power testing up to five percent full power. La Salle-2 is a boiling water reactor with a capacity of 1078 MW.

Irene Johnson, spokesperson for Commonwealth Edison, said fuel loading was completed early in February and that low power testing was to begin shortly.

Spring start-up

She said the utility hopes to have the unit on-line in April or May.

Unit 1 was licensed in August 1982.

Coal industry sees modest gains in '84; feels utilities won't build up inventories as strike hedge

WASHINGTON—The National Coal Association, trade association of U.S. coal mining companies, predicts that production and consumption of coal in 1984 will be up only slightly over 1983 levels (see table.)

However, a major uncertainty in the forecast is how utilities will deal with the potential for a United Mine Workers strike when their labor contract expires on September 30, 1984. The NCA forecast assumes no strike and no change in consumers coal stockpile levels.

Prior to the 1983-84 winter cold spell utility stockpiles were about 95 days worth of coal, a normal level. In March, 1981, just prior to expiration of the previous labor contract, utility coal stocks had increased to 120 days. However, the coal industry does not feel utilities will build up inventories much above the 100-day level this time, says Jerry Karaganis, NCA vice president for economics. He says the 1981 inventory level is misleading because at least some of the buildup was due to less demand for electricity than expected due to the economic recession.

NCA does not expect utilities to do much of any strike-hedge buying in 1984 because conditions are far different than in the past, says Karaganis. He says that the percentage of coal produced by union miners has dropped to only 40 percent of the total, diluting the effect of a strike and permitting non-union sources to make up much of the lost union production, an effect first seen during the three-month 1981 strike.

NATIONAL COAL ASSOCIATION 1984 FORECAST
(Millions of tons)

Category	1982 Final	1983 Est.	1984 Forecast	Percent Change 1984/83
Domestic Consumption				
Electric Utilities	593	610	618	+ 1.3
Coking Coal	41	39	45	+15.4
General Industry and Retail	70	72	75	+ 4.2
Total Domestic Markets	704	721	738	+ 2.4
Exports To				
Canada: Steam	13	9	9	+ 0.0
Metallurgical	5	6	6	+ 0.0
Total	18	15	15	+ 0.0
Overseas: Steam	27	18	20	+11.1
Metallurgical	60	42	44	+ 4.8
Total	87	60	64	+ 6.7
Total Exports	105	75	79	+ 5.3
Total Consumption	809	796	817	+ 2.6
Consumers' Stock Change	14	-8	0	–
Total Demand	823	788	817	+ 3.7
Production				
East	560	515	540	+ 4.9
West	274	265	276	+ 4.2
Total U.S.	834	780	816	+ 4.6
Prod./Distr. Stock Changes	12	-7	0	–
Imports	1	1	1	–
Total Marketed Supply	823	788	817	+ 3.7

Karaganis says utilities have improved energy wheeling capability substantially in recent years, both inter-utility wheeling and importing from Canada.

He adds that utilities are looking for a good hydro year in 1984 with the big snowfalls this winter so far and nuclear plants promise to contribute more than in the past. All these factors should induce utilities to save money on coal inventory costs by keeping stocks at normal levels.

"It'll be interesting to see what happens," says Karaganis, admitting that there is potential for more consumption, which would be good news for the coal industry.

He says the cold winter may require an upward revision in consumption and production forecasts. The current forecast was made in December before the cold snap set in: "Who could have predicted a 100-year cold wave following a 50-year heat wave the preceding summer?" The cold wave pushed electricity consumption, and hence utility coal consumption, far above expected levels, driving stockpiles well below fall levels. NCA's Vice President Karaganis said there may have to be some inventory rebuilding to get back up to the 100-day level this spring.

Another major variable in the forecast is exports which dropped from a high of 113 million tons in 1981 to 75 million tons last year. NCA looks for a modest gain in 1984.

Karaganis admits the uncertainty in the forecast seems to be on the upside, with increases over the forecasted levels likely. NCA estimates, however, that there is 200 million tons per year of overcapacity in the nation's mines, so the industry should be able to handle any increase.

Seabrook cooling water tunnels completed

MANCHESTER, NH—Two deep-bedrock ocean cooling water tunnels at the Seabrook Nuclear Plant have been completed, said Public Service of New Hampshire (PSNH).

The tunnel system had been under construction since 1977 and is designed to bring ocean water into the plant's turbine-generator buildings to work as a cooling system.

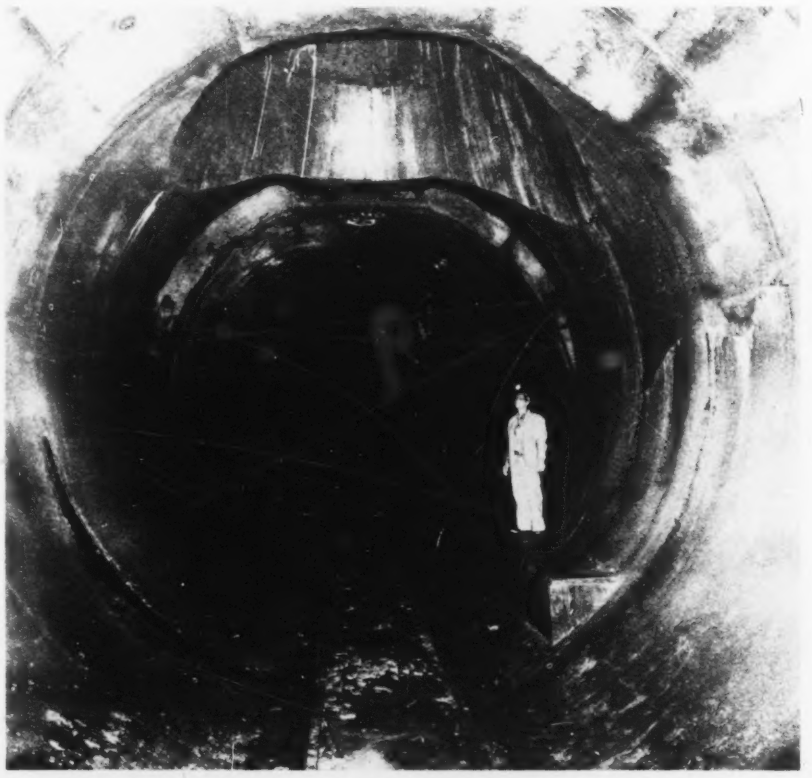
More than three miles long each, the two tunnels start 260 ft below sea level at the Seabrook pumphouse and run parallel to a point under the Hampton-Seabrook Bridge.

At the ocean end, the intake shafts are topped by 30 ft diameter concrete structures that will direct water into the tunnels at a velocity of less than one foot per second, said PSNH.

Water will flow from the ocean through the intake tunnel at a rate of 824,000 gallons per minute, up vertical shafts into the pumphouse where six 3,600-horsepower pumps will feed it into the plant's condenser cooling system.

After traveling through the condenser system, double-nozzle fixtures will diffuse the returning warm water so it will quickly mix with the ocean water.

PSNH said the tunnels are now being allowed to fill with natural groundwater that seeps into them at a rate of approximately 600 gallons per minute.



Standing at the ocean end of one of the Seabrook Plant's 19 ft diameter cooling water tunnels, a site geologist examines one of three intake shafts that will feed water into the tunnel.

Comanche delayed

DALLAS—Texas Utilities Co. said the estimated fuel load date for the Comanche Peak-1 nuclear plant has been delayed six-months to mid-1984.

The utility also said the estimated plant cost has been revised upward from $3.44 billion to $3.89 billion.

Texas Utilities cited final construction, inspection and activities relating to testing as the main resaons for the changes in estimates. The utility said construction is basically completed, but painting, electrical cables, documentation, final inspection and testing activities are taking more time than previously scheduled.

The utility announced that because of an excess of generating capacity, the lignite-fueled Twin Oak-1 plant will now be planned for service in 1989. It was originally scheduled for service in 1988.

Iowa utilities begin central dispatch

DES MOINES, IA—Five Iowa electric utilities have approved the formation of a partnership to operate a common dispatch control system, said Iowa Power & Light Co. President James R. Lyon.

He said the group will consist of IP&L, Iowa Electric Light & Power, Iowa-Illinois Gas & Electric Co., Iowa Public Service and Iowa Southern Utilities.

An interim control center will be operational this month in Des Moines. The site for the permanent center will be picked in 1985 after initial operating data from the interim center is analyzed.

"The single control center will allow customers to realize savings of the most economical electric generation to the extent that it is not fully utilized by the owners," said Lyon.

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